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## (54) POLYESTER FILM REDUCED IN WEIGHT AND ITS PRODUCTION

### (57)Abstract:

**PURPOSE:** To obtain a polyester film excellent in lightweight and masking properties and useful as labels, etc., and a method for producing the aforementioned film.

**CONSTITUTION:** The subject polyester film reduced in weight is a polyester film composed of a composition composed of (A) a crystalline polyester resin and (B) a copolymer composed of at least one cyclic olefin selected from the group consisting of ethylene/bicycloalkenes and tricycloalkenes. The aforementioned component (B) is dispersed in the form of particles. Fine voids are present and the weight is reduced. The aforementioned polyester film is obtained by orienting an unoriented film prepared from the composition of both at a temperature within the range of the glass transition temperature or above and the crystallization temperature or below of the above-mentioned component (A) at  $\geq 1.5$  times in at least one axial direction.

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### LEGAL STATUS

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**CLAIMS**

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[Claim(s)]

[Claim 1] The lightweight-ized polyester film which crystalline polyester resin (A) is the polyester film with which less than 95 % of the weight and an annular olefine copolymer (B) consist of a constituent with less than 50 % of the weight 5% of the weight or more 50% of the weight or more, this annular olefine copolymer (B) is distributing 20 micrometers in the shape of grain from the diameter 0.1 in this polyester film, and a detailed void exists, and is characterized by apparent specific gravity being 0.3 to 1.1.

However, this annular olefine copolymer (B) is a copolymer which consists of a kind of annular olefin chosen out of the group which consists of ethylene, and a bicyclo alkene and a tricyclo alkene at least, and has a glass transition temperature higher at least 10 degrees C than the glass transition temperature of this crystalline polyester resin.

[Claim 2] The manufacture technique of the lightweight-ized polyester film given in the 1st term of a claim characterized by extending the non-extended polyester film with which crystalline polyester resin (A) carries out melting extrusion of the constituent with which less than 95 % of the weight and an annular olefine copolymer (B) consist of less than 50 % of the weight 5% of the weight or more 50% of the weight or more, and was obtained 1.5 or more times to at least 1 shaft orientations in the domain of the temperature below crystallization temperature more than the glass transition temperature of this crystalline polyester resin (A).

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## DETAILED DESCRIPTION

### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] Including a detailed void, this invention is a low density (specific gravity is smallness), and relates to the polyester film excellent in an intensity, thermal resistance, concealment nature, and note nature, and its manufacture technique. With the outstanding property, the lightweight-ized polyester film of this invention is used for a label, an information, drawing paper, a print sheet, etc.

#### [0002]

[Description of the Prior Art] the technique (for example, JP,50-38765,A, JP,57-46456,B, JP,57-34931,A) of adding (\*\*) gas or the vaporizable matter as an attempt which lightweight-izes a polyester film, and (\*\*) -- the technique (for example, JP,52-43871,A, JP,58-50625,B) of adding the matter which generates gas by the chemical reaction, and the matter \*\*\*\*\* to (\*\*) solvent are added, and the method (for example, JP,51-34963,A, JP,52-27666,B) of extracting this by the solvent behind etc. is learned. However, no such technique is almost put in practical use. Although it is possible to make a void generate in a polyester film by such technique as the ground, the control of the size is very difficult, and it is mentioned that the fraction with an extremely low intensity generates the spatial distribution in the thing been easy to become uneven, therefore a polyester film it is not only easy to become a big and rough void, but, and a disconnection of a film tends to happen at the time of extension etc. The film furthermore obtained by such technique was not what can be satisfied in the lightweight nature, an intensity, concealment nature, note nature, and the homogeneity of a performance.

[0003] Moreover, although the technique it is difficult to carry out particle variance since it is easy to condense inorganic grain secondarily, and it adds inorganic grain at the time of a polymerization although there is the technique (for example, JP,63-137927,A) of adding inorganic grain is taken (for example, JP,63-66222,A), when adding inorganic grain so much, similarly it may condense secondarily or the polymerization degree of thermoplastic polyester resin may be affected at least. Moreover, since inorganic grain is stuck for the screen even if it is going to carry out the melting knockout of the inorganic grain heat-of-mixing plasticity polyester resin and it is going to obtain a film, the coarse screen of a mesh will be used, there is a possibility that big dust may mix in a film, and a film may cut at the time of extension. moreover, the case of inorganic grain -- molding -- it has the fault of wearing the lip of metal mold Furthermore, when inorganic grain existed in a film, in the cutting manipulation of a slit manipulation of a film etc., the life of a knife became remarkably short, the productivity fell, and it dealt with carrying out a cut with the edge of a film etc., and there was a problem also in a sex. Moreover, since the head of a picture-recording machine is worn when using it for magnetic tapes, it has been a problem.

[0004] The technique of generating a void is proposed by carrying out melting extrusion of the constituent which blended the void plasticity polymer with polyester resin to such technique, and extending a unstretched film, nothing, and this (for example, JP,63-168441,A, JP,2-235942,A). And as an example of such a void plasticity polymer, polypropylene, polystyrene, a polymethylmethacrylate, a poly-methyl pentene, polyphenylene sulfide, a polyphenylene oxide, and mesomorphism polyester are

mentioned. By this technique, a void plasticity polymer is distributed in the shape of a particle in a polyester film, and the diameter of a particulate material is dependent on the compatibility and those melt-viscosity differences of a void plasticity polymer and polyester. And by extending the unstretched film which consists of this constituent on at least 1 shaft, sublation occurs in the interface of the void plasticity polymer and polyester which were distributed in the shape of a particle, and a void is formed. In addition to extension conditions, it depends for the grade of void occurrence on the glass transition temperature of a void plasticity polymer, and the compatibility of a void plasticity polymer and polyester. The method of obtaining a lightweight-ized polyester film is the technique which does not have the fault mentioned by the technique of the above-mentioned (b), (b), and (c), and was more excellent by blending this void plasticity polymer. However, in the lightweight-ized polyester film which used the above-mentioned polymer which solves and was proposed concretely as a void plasticity polymer, the performance cannot yet be satisfied necessarily.

[0005] For example, since the melt viscosity of these voids plasticity polymer in the melting extrusion temperature of polyester resin is low when the polymer of comparatively low glass transition temperatures, such as polypropylene, polystyrene, a polymethylmethacrylate, and a poly-methyl pentene, is used as a void plasticity polymer, the void plasticity polymer in the unstretched film which carried out melting extrusion of the constituent and obtained it tends to serve as the cylindrical grain which carried out orientation in the flow orientation of polyester, and it is hard to distribute it to a spherical particle by the shearing stress at the time of melting. Therefore, each the unstretched film and oriented film which consist of such a constituent had the trouble where an anisotropy was large. Moreover, if the unstretched film which consists of such a constituent is extended at the temperature more than the glass transition temperature of polyester resin, since the glass transition temperature of a void plasticity polymer is low, it will be easy to deform the dispersed void plasticity polymer plastically, and occurrence of a void will be checked. In addition, the grade of the irregularity with a detailed oriented-film front face becomes inadequate. Therefore, the film which consists of such a constituent is not satisfactory in respect of lightweight-izing and concealment nature and note nature. Since the glass transition temperature of a void plasticity polymer is still low, the trouble where the film which consists of such a constituent has a large performance change at the temperature exceeding it is also pointed out. On the other hand, when polyphenylene sulfide and a polyphenylene oxide are used as a void plasticity polymer, since these polymers have the comparatively high glass transition temperature, there is no above-mentioned \*\*\*\* trouble. However, these polymers are colored in itself and the film which consists of such a constituent has the fault that it is inferior to a whiteness degree.

[0006] By the technique using mesomorphism polyester as a void plasticity polymer, the trouble produced since the trouble accompanied by being easy to become the cylindrical grain in which it carried out orientation in the flow orientation in the unstretched film, and the compatibility with polyester are remarkable and are low occurs entirely. Moreover, it cannot be overemphasized that it is also inferior to a whiteness degree.

[0007] Since the suitable void plasticity polymer was not discovered in the technique of blending a void plasticity polymer with polyester resin like the above, the actual condition was that the lightweight-ized polyester film which has a satisfactory property was not obtained.

[0008]

[Problem(s) to be Solved by the Invention] It is in offering the polyester film which the technical problem of this invention found out the void plasticity polymer which has the moderate compatibility and the melt-viscosity difference with polyester, and is a low density and was excellent in an intensity, thermal resistance, concealment nature, and note nature from such a situation using this, and its manufacture technique.

[0009]

[Means for Solving the Problem] This invention persons consist of a constituent of crystalline polyester resin (A) and an annular olefine copolymer (B), as a result of repeating a research zealously, in order to solve the above-mentioned technical problem, find out that the polyester film which has specific structure satisfies the technical problem of this invention entirely, and reach this invention.

[0010] That is, crystalline polyester resin (A) is the polyester film with which less than 95 % of the weight and an annular olefine copolymer (B) consist of a constituent with less than 50 % of the weight 5% of the weight or more 50% of the weight or more, this annular olefine copolymer (B) is distributing 20 micrometers in the shape of grain from the diameter 0.1 in this polyester film, and a detailed void exists, and the first summary of this invention is a lightweight-sized polyester film characterized by apparent specific gravity being 0.3 to 1.1. However, this annular olefine copolymer (B) is a copolymer which consists of a kind of annular olefin chosen out of the group which consists of ethylene, and a bicyclo alkene and a tricyclo alkene at least, and has a glass transition temperature higher at least 10 degrees C than the glass transition temperature of this crystalline polyester resin.

[0011] Moreover, the second summary of this invention consists in the manufacture technique of the above-mentioned lightweight-sized polyester film characterized by extending the non-extended polyester film with which crystalline polyester resin (A) carries out melting extrusion of the constituent with which less than 95 % of the weight and an annular olefine copolymer (B) consist of less than 50 % of the weight 5% of the weight or more 50% of the weight or more, and was obtained 1.5 or more times to at least 1 shaft orientations in the domain of the temperature below crystallization temperature more than the glass transition temperature of this crystalline polyester resin (A).

[0012] In this invention, it means that the heat of fusion of the crystal which measured crystallinity by 20 degree-C programming rate for /using the differential-thermal-analysis meter shows the value more than 1cal/g. Moreover, crystallization temperature is defined as a crystallization temperature peak at the time of similarly measuring by 20 degree-C programming rate for /using a differential-thermal-analysis meter. A glass transition temperature means the freeze start temperature of the thermal motion of a polymer principal chain as it generally defines. This glass transition temperature can also be measured using a differential-thermal-analysis meter.

[0013] The crystalline polyester resin (A) used in this invention is polyester which makes the main constituents an aromatic dicarboxylic-acid residue, an aliphatic diol residue and/, or an alicyclic diol residue. As an example of representation of such an aromatic dicarboxylic acid, there are a terephthalic acid, an isophthalic acid, a naphthalene dicarboxylic acid, etc. The aromatic ring of these aromatic dicarboxylic acids may be replaced by the halogen, the alkyl group, or other substituents. As an example of representation of an aliphatic diol or an alicyclic diol, there are ethylene glycol, a diethylene glycol, a propylene glycol, a butylene glycol, neopentyl glycol, cyclo hexylene dimethanol, etc. Respectively, two or more kinds are mixed and these aromatic dicarboxylic acids, an aliphatic diol and/, or an alicyclic diol can also be used.

[0014] In this invention, there are a polyethylene terephthalate (PET), a polybutylene terephthalate (PBT), polyethylenenaphthalate (PEN), and polycyclohexylene dimethylene terephthalate (PCT) as suitable crystalline polyester resin especially. The glass transition temperature (Tg), the crystallization temperature (Tc), and the crystal melting temperature (Tm) which were measured using the differential-thermal-analysis meter of these crystallinity polyester resin are as follows.

PET (Tg=70 degree C, Tc=160 degree C, Tm=263 degree C)

PBT (Tg=45 degree C, Tc=130 degree C, Tm=220 degree C)

PEN (Tg=115 degree C, Tc=220 degree C, Tm=272 degree C)

PCT (Tg=90 degree C, Tc=180 degree C, Tm=295 degree C)

[0015] In this invention, you may use the crystalline polyester resin which could be mixed two or more kinds, and could use such crystalline polyester resin, and copolymerized other components.

[0016] These crystalline polyester resin carries out the direct reaction of an aromatic dicarboxylic acid, an aliphatic diol and/, or the alicyclic diol, is manufactured, and also it is manufactured by the technique of the grade to which the transesterification of the alkyl ester of an aromatic dicarboxylic acid, an aliphatic diol and/, or the alicyclic diol was carried out and to which a back polycondensation is carried out or the polycondensation of the diethylene glycol ester of an aromatic dicarboxylic acid is carried out.

[0017] Although it is sufficient if there is especially no limit about the molecular weight of the crystalline polyester resin used in this invention and there is film organization potency, it is desirable

that the intrinsic viscosity measured at 25 degrees C by the mixed solvent of a phenol / tetrachloroethane = 1 / 1 (weight ratio) is more than 0.4 (dl/g).

[0018] The annular olefine copolymer (B) used in this invention has a glass transition temperature higher at least 10 degrees C than the glass transition temperature of the crystalline polyester which is the copolymer which consists of ethylene and at least one sort of annular olefins chosen out of the group which consists of a bicyclo alkene and a tricyclo alkene, and constitutes a constituent.

[0019] As an example of representation of such an annular olefin, bicyclo [2, 2, 1] hept-2-\*\*\*\*\*, 6-methyl bicyclo [2, 2, 1] hept-2-\*\*\*\*\*, 5, 6-dimethyl bicyclo [2, 2, 1] hept-2-\*\*\*\*\*, 1-methyl bicyclo [2, 2, 1] hept-2-\*\*\*\*\*, 6-ethyl bicyclo [2, 2, 1] hept-2-\*\*\*\*\*, 6-n-butyl bicyclo [2, 2, 1] hept-2-\*\*\*\*\*, 6-i-butyl bicyclo [2, 2, 1] hept-2-\*\*\*\*\*, 7-methyl bicyclo [2, 2, 1] hept-2-\*\*\*\*\*, tricyclo [4, 3, 0, 12.5]-3-decene, There are 2-methyl-tricyclo [4, 3, 0, 12.5]-3-decene, 5-methyl-tricyclo [4, 3, 0, 12.5]-3-decene, tricyclo [4, 4, 0, 12.5]-3-decene, 10-methyl-tricyclo [4, 4, 0, 12.5]-3-decene, etc.

[0020] Although copolymerization of the annular olefin which illustrated the annular olefine copolymer used by this invention by ethylene and the above is carried out, the domain of the content of this annular olefin component in this copolymer is usually below more than 10 mol % 60 mol %, and the content of an ethylene component is usually a copolymer below more than 40 mol % 90 mol %. Moreover, in the domain which does not spoil the purpose of this invention other than two components of this \*\*\*\*\*, copolymerization of the unsaturation monomer component in which other copolymerization is possible can be carried out if needed. As an unsaturation monomer in which this copolymerization is possible, a propylene, 1-butene, 4-methyl-1-pentene, 1-hexene, 1-octene, 1-decene, 1-dodecen, 1-tetrapod decene, Carbon atomic numbers, such as 1-hexa decene, 1-octadecene, and 1-ray \*\*\*\*\*\*, the alpha olefin of 3 to 20, A cyclopentene, a cyclohexene, 3-methyl cyclohexene, a cyclo octene, 1, 4-hexadiene, the 4-methyl -1, 4-hexadiene, the 5-methyl -1, 4-hexadiene, 1, 7\*\*\*\*\* diene, a dicyclopentadiene, 5-ethylidene-2-norbornene, 5-vinyl-2\*\*\*\*\*\*, tetracyclo dodecen, 2-methyl tetracyclo dodecen, 2-ethyl tetracyclo dodecen, etc. can be illustrated. The annular olefine copolymer used in this invention can be manufactured by the well-known liquid phase polymerization method. For example, an annular olefine copolymer can be manufactured according to the technique illustrated by JP,61-271308,A.

[0021] The annular olefine copolymer used in this invention has at least 10 degrees C and a still desirable glass transition temperature high at least 20 degrees C rather than the glass transition temperature of crystalline polyester resin. The glass transition temperature of an annular olefine copolymer is equivalent to it of crystalline polyester resin, or when lower than it, since an annular olefine copolymer will deform plastically and generation of a void will be checked if the film which consists of a constituent is extended, it is not desirable. In addition, the grade of the irregularity with the detailed front face of an oriented film becomes inadequate. When the low annular olefine copolymer of such a glass transition temperature is used, the lightweight nature of the extension polyester film obtained as a result, concealment nature, and note nature are not satisfactory.

[0022] There is especially no limit about the molecular weight of the annular olefine copolymer used in this invention, and in the temperature at the time of the melting extrusion of a constituent, if it is the molecular weight of the melt viscosity of crystalline polyester resin which gives 1/10 or more melt viscosities at least, it is sufficient.

[0023] The loadings of the crystalline polyester resin which is (A) component of the constituent which constitutes the lightweight-ized polyester of this invention are less than 95 % of the weight 50 % of the weight or more, and it of the annular olefine copolymer of (B) component is less than 50 % of the weight 5 % of the weight or more. (B) There are few amounts of generation of the detailed void in the final extension polyester film with which the loadings of the annular olefine copolymer of a component are obtained at less than 5 % of the weight, and they become inadequate [ lightweight nature and concealment nature and note nature ]. Conversely, since the intensity of a film falls [ it ] at 50 % of the weight or more, the thermal stability at the time of the melting extrusion of a constituent falls the fracture at the time of extension not only becomes easy to happen, but and a pyrolysis etc. occurs, it is not desirable.

[0024] In the lightweight-ized polyester film of this invention, the annular olefine copolymer of (B)

component requires that a diameter should distribute 0.1 to 20 micrometers in the shape of grain in the matrix which consists of crystalline polyester resin which is (A) component, and the domain of it is 1-15 micrometers preferably. In this case, as for the particle of an annular olefine copolymer, it is desirable that it is a globular form as much as possible. Since the film which was hard to generate the different rectangle of a film in the globular form case, and the uniform void generated by extension, and was excellent in the intensity is obtained, it is desirable. When the diameter of a particle of an annular olefine copolymer is less than 0.1 micrometers, there are few amounts of generation of the void in an extension polyester film, and they become inadequate [ lightweight nature and concealment nature and note nature ]. Conversely, when it exceeds 20 micrometers, there are many amounts of generation of a void, and although excelled in lightweight nature and concealment nature, since the intensity of a film falls and the fracture at the time of extension becomes easy to happen, it is not desirable.

[0025] In this invention, a unstretched film carries out melting extrusion of the constituent which consists of crystalline polyester resin (A) and an annular olefine copolymer (B), and is obtained. In this case, melting kneading of crystalline polyester resin (A) and the annular olefine copolymer (B) is carried out using an extruder etc., it may make with the pellet of a constituent beforehand, subsequently melting extrusion of this may be carried out, and a unstretched film may be obtained. Or crystalline polyester resin (A) and an annular olefine copolymer (B) may be blended, direct melting extrusion of this may be carried out, and a unstretched film may be obtained. As melting extrusion temperature, it is chosen in the domain of temperature usually higher 50 degrees C than the crystal melting temperature or this temperature of crystalline polyester resin. It extrudes from a T die or a circular die, and is cooled below at the glass transition temperature of crystalline polyester resin, and the constituent by which melting was carried out obtains an amorphous film substantially. There is no generation of a void in this unstretched film, and, in many cases, it is substantially transparent or translucent to it.

[0026] Subsequently, this unstretched film is extended by at least 1 shaft orientations. Extension is performed at the temperature of the domain below crystallization temperature more than the glass transition temperature of crystalline polyester resin. A void is effectively generated by the interface with the annular olefine copolymer which forms a particle at the same time the crystalline polyester which forms a matrix by extending by this temperature requirement carries out orientation crystallization. A draw magnification has big influence on the property of the film obtained. The lightweight nature of the film obtained so that a draw magnification is large, concealment nature, and an intensity improve. Although it is possible to select a draw magnification according to the purpose, in order to attain the purpose of this invention, to extend to 1.5 or more times is required for at least 1 shaft. It is also possible to extend to in-every-direction biaxial furthermore. In this case, enhancement in a property can be aimed at further. Also in this case, it is desirable to extend 1.5 or more times in each orientation.

[0027] The heat setting of the polyester film after extension is carried out if needed. The dimensional stability of an extension polyester film increases further by this processing. Usually, temperature of a heat setting is performed at temperature low 30 degrees C from about 10 degrees C from the crystal melting temperature of crystalline polyester resin.

[0028] When the lightweight-ized polyester film of this invention extends, 1.1 or less are the apparent specific gravity. By raising a draw magnification further, it is also possible to make apparent specific gravity or less into 0.3. However, since the productivity of an oriented film and a strong fall arise, as for the apparent specific gravity of a lightweight-ized polyester film, it is desirable that it is in the domain of 0.3 to 1.1. The domain of the most desirable specific gravity from a productivity or the field of a performance is 0.5 to 1.0.

[0029] You may blend other polymers with the constituent of this invention in the domain which does not spoil the property greatly if needed. As such a polymer, there are polyethylene, polypropylene, polystyrene, a poly-methyl pentene, a polymethylmethacrylate, ABS plastics, a polycarbonate, a polyamide, a polyphenylene oxide, a polyarylate, a polyethylene glycol, a poly-ape phon, a polyether ape phon, a polyether ether ketone, polyphenylene sulfide, a phenoxy resin, a polyvinyl chloride, a polyvinylidene chloride, liquid crystal polyester, a fluororesin, phenol resin, melamine resin, a urea resin, an epoxy resin, etc.

[0030] Moreover, it is also possible to blend minerals fillers and pigments, such as a silica, titanium oxide, a calcium carbonate, an alumina, a kaolin, a mica, and talc, with the constituent of this invention in the domain which does not spoil the property greatly if needed.

[0031] Moreover, it is also possible to blend other additives. As such an example, there are an antioxidant, a heat-resistant agent, an antistatic agent, an ultraviolet ray absorbent, a lubricant, a coloring agent, etc.

[0032] The lightweight-ized polyester film of this invention is used for the charge of packing material, a label, an information, drawing paper, a print sheet, etc., after coming out independently or processing paint, printing, a metallizing, etc. Moreover, the lightweight-ized polyester film of this invention can also be used as one of the constituents of the multilayer-structure field. A laminate film, a compound sheet, a composite, etc. occur as an example of such multilayer-structure field.

[0033]

[Example] Although an example explains this invention still concretely below, this invention is not limited to these.

[0034] (Example 1 of reference) It sets in proportion of 6-ethyl bicyclo [2.2.1] hept-2-\*\*\*\* 60g and toluene 1L, and is VO(OC<sub>2</sub>H<sub>5</sub>) Cl<sub>2</sub> as a vanadium compound. The copolymerization reaction which supplied ethylene in 40L / time, and supplied nitrogen in 80L / time was continuously carried out at 10 degrees C [ so that 1mmol/L, and ethylaluminium sesquichloride may be set to 4mmol/L ].

Subsequently, suspended the polymerization with the little methanol, it was made to precipitate with a lot of acetone/methanols, and the annular olefine copolymer was obtained (\*\* -1). Other annular olefine copolymers were obtained similarly. These are shown in Table 1. In addition, the glass transition temperature was shown in Table 3.

[0035]

[Table 1]

共重合体	環状オレフィン		環状オレフィン 共重合体の エチレン含量 (モル%)
	化合物名	仕込量 (g)	
ア-1	6-エチルビシクロ[2,2,1]ヘプト-2-エン	60	62
ア-2	6-エチルビシクロ[2,2,1]ヘプト-2-エン	30	84
ア-3	6-メチルビシクロ[2,2,1]ヘプト-2-エン	60	63
ア-4	トリシクロ[4,3,0,1 <sup>2,5</sup> ]辛-3-デセン	60	62
ア-5	ビシクロ[2,2,1]ヘプト-2-エン	60	64

[0036] (Examples 1-7) Using the \*\*\*\* type vacuum dryer made from \*\*\*\*\*\*, the vacuum drying was carried out at 120 degrees C for 48 hours, and the moisture regain was mixed by the Henschel mixer by 0.001% of the annular olefine-copolymer pellet, and the blending ratio of coal the limiting viscosity indicated the polyethylene-terephthalate pellet (\*\* -1 of the following table 2) of 0.78 to be to Table 3, and obtained the melting knockout and the sheet with a thickness of 500 micrometers by the T die on 280-degree C conditions using 50mmphi extruder made from Made-in-Japan Steel. Subsequently, it extended 3 times to MD (lengthwise) at 90 degrees C at 3 times and TD (longitudinal direction), and the film with a thickness of 55micro was obtained. The diameter of a particulate material of the annular olefine copolymer in a unstretched film, ductility, and the apparent-specific-gravity [ of an oriented film ], 3-dimensional surface-roughness, and Hayes (Hz) parallel ray transmittance (Tp), glossiness (G), a whiteness degree, tensile strength and note nature are shown in Table 4. Moreover, as crystalline polyester resin, the example 7 which used polybutyrene terephthalate resin (\*\* -2 of Table 2) is 260 degrees C in film production temperature, and was carried out on 60-degree C extension temperature conditions. The performance of a film is similarly shown in Table 4.

[0037]

[Table 2]

	結晶性ポリエステル樹脂	極限粘度 [η]
イ-1	ポリエチレンテレフタレート	0.78
イ-2	ポリブチレンテレフタレート	0.58

[0038]  
[Table 3]

	ポリマー 一 イ	配合割合 (重量%)	配合 ボリマー ( $T_g$ ) (°C)	未延伸フィルム 粒子径 ( $\mu$ m)	延伸性		
					温度 (°C)	倍率 M D X T D	延伸性
実施例 1	ア - 1	2 0	1 0 0	1 ~ 8	9 0	3 × 3	良好
	イ - 1	8 0					
実施例 2	ア - 3	2 0	9 9	1 ~ 1 0	9 0	3 × 3	良好
	イ - 1	8 0					
実施例 3	ア - 1	1 0	1 0 0	1 ~ 1 0	9 0	3 × 3	良好
	イ - 1	9 0					
実施例 4	ア - 1	3 0	1 0 0	1 ~ 1 0	9 0	3 × 3	良好
	イ - 1	7 0					
実施例 5	ア - 4	2 0	9 8	1 ~ 9	9 0	3 × 3	良好
	イ - 1	8 0					
実施例 6	ア - 5	2 0	9 9	1 ~ 1 0	9 0	3 × 3	良好
	イ - 1	8 0					
実施例 7	ア - 1	2 0	1 0 0	1 ~ 8	6 0	3 × 3	良好
	イ - 2	8 0					

[0039]  
[Table 4]

	比 重	延伸 フ ィ ル ム						筆記 性
		表面粗度 (*)		H Z ( % )	T P ( % )	G ( % )	白 色 度	
S R a	S P c							
実施例 1	0 . 8 6	0 . 2 2	8 3	9 0	0 . 9	1 . 4	9 7	1 5 ○
実施例 2	0 . 8 3	0 . 2 5	8 5	9 1	0 . 9	1 . 5	1 0 0	1 3 ○
実施例 3	1 . 0 3	0 . 2 5	4 0	8 0	1 . 5	2 . 6	1 0 1	1 6 ○
実施例 4	0 . 5 8	0 . 2 8	1 2 1	9 5	0 . 8	0 . 9	1 0 9	1 1 ○
実施例 5	0 . 8 4	0 . 2 2	8 1	9 1	0 . 9	1 . 5	9 9	1 4 ○
実施例 6	0 . 8 3	0 . 2 3	7 9	8 9	0 . 9	1 . 6	9 9	1 4 ○
実施例 7	0 . 8 6	0 . 2 1	8 2	9 0	0 . 9	1 . 4	9 7	1 5 ○

[0040] (Examples 1-7 of a comparison) The melting knockout of the pellet was dried and carried out by the same technique as an example, and the film with a thickness of 500 micrometers was obtained. Extension temperature was carried out on conditions (90 degrees C, 60 degrees C, and 200 degrees C). Moreover, the draw magnification was carried out by 3x3 times except having been referred to as 1.2x1.0 in the example 6 of a comparison. Moreover, in the example 7 of a comparison, the polyphenylene-oxide resin (Nagase& Co., Ltd.-PO-534) was used for the addition polymer as a comparison of an annular olefine copolymer. Experiment conditions are shown in Table 5, and the performance of a film is shown in Table 6.

[0041]

[Table 5]

	ボリマー	配合割合 (重量%)	配合 ポリマー Tg (°C)	未延伸フィルム 粒子径 (μm)	延伸		
					温度 (°C)	倍率 MD × TD	延伸性
比較例 1	ア - 2 イ - 1	2 0 8 0	3 0	0 . 3 ~ 4	9 0	3 × 3	不良
比較例 2	ア - 1 イ - 1	3 9 7	1 0 0	0 . 5 ~ 8	9 0	3 × 3	良好
比較例 3	ア - 1 イ - 1	5 5 4 5	1 0 0	粒子無し	9 0	3 × 3	良好
比較例 4	ア - 1 イ - 1	2 0 8 0	1 0 0	1 ~ 8	6 0	3 × 3	不良
比較例 5	ア - 1 イ - 1	2 0 8 0	1 0 0	1 ~ 8	2 0 0	3 × 3	不良
比較例 6	ア - 1 イ - 1	2 0 8 0	1 0 0	1 ~ 8	9 0	1 . 2 × 1	良好
比較例 7	PPO イ - 1	2 0 8 0	1 8 6	5 ~ 3 0	9 0	3 × 3	良好

[0042]  
[Table 6]

	比重	延伸 フィルム						筆記 性
		表面粗度		H z ( % )	T p ( % )	G ( % )	白色度 Kg/mm <sup>2</sup>	
S R a	S P c							
比較例 1	1 . 2 0	0 . 1 1	0 . 4	7 4	4 . 5	6 . 6	8 4	7 7 X
比較例 2	1 . 3 0	0 . 0 9	1 5	4 5	2 8	2 3	8 1	1 8 X
比較例 3	1 . 3 2	0 . 0 1	3	8 0	0 . 9	9 5	7 0	1 0 X
比較例 4	—	—	—	—	—	—	—	—
比較例 5	1 . 3 0	0 . 0 9	1 5	4 5	2 8	2 5	8 2	1 5 X
比較例 6	1 . 3 0	0 . 0 1	3	2 0	7 0	9 8	7 5	5 X
比較例 7	0 . 7 8	0 . 3 0	9 5	9 5	0 . 8	0 . 9	7 0	6 ○

( \* ) S R a : 中心面平均粗さ ( μm ), S P c : 山数 ( 個 / 0 . 1 mm<sup>2</sup> )

[0043] Examples 1-7 and the examples 1-7 of a comparison show the following thing. When the ethylene component of an annular olefine-copolymer constituent is 84 mol %, crystallization polyester resin and an annular olefine-copolymer constituent film understand that lightweight nature and matte nature and white nature are missing. It turns out that an annular olefine copolymer lacks similarly 3% of the weight of crystalline polyester resin, and an annular olefine-copolymer constituent film at lightweight nature and matte nature and white nature. Moreover, it turns out that the diameter of a particulate material is not checked but 55% of the weight of crystalline polyester resin and an annular olefine-copolymer constituent film lack an annular olefine copolymer at lightweight nature and matte nature and white nature.

[0044] About extension temperature, 90 degrees C is good. At 60 degrees C, a film fractures and it is inferior to ductility. When it extends at 200 degrees C, it turns out that film thickness nonuniformity lacks film quality in size at thing [ which is being fallen greatly ] and lightweight nature, and matte nature and white nature. By 1.2x1.0 times, it turns out that lightweight nature and matte nature and white nature are missing also about a draw magnification. Moreover, in the example 7 of a comparison, it turns out that the intensity of the film obtained when the particulate material exceeded 20 micrometers falls remarkably.

[0045] (Measuring method) The measuring method used in the example is as follows.

1. Particle-diameter JEOL Co., Ltd. make A JSM-15 type scanning electron microscope is used and it is \*\* of the sample fracture surface. \*\*\*\* A dimension is read in a fine mirror photograph.
2. According to apparent specific gravity JISK6758, it measured by the underwater substitution method.
3. a surface roughness -- the Kosaka Lab tabulation side granularity measuring instrument SE-3AK type was used, and it measured according to the technique of JISB-0601-1976 2 micrometers of the diameters of a sensing pin, 10mg of \*\*\*\*\*s

4. Degree (Hz) Parallel Ray Transmittance (Tp) [ of Overcast ]

Hazemeter made from the Tokyo \*\*\*\* It measured according to use and ASTMD 1003-61.

5. G% Murakami color technical research center Gloss Meter GM-30 type is used. Glossiness with an incident angle of 20 degrees was measured.

6. It measured using the whiteness-degree \*\*\*\* testing-machine SM-4 type color difference meter.

7. Intensity (Tensile Strength)

The Shimazu DSS-500 type autograph was used, and it measured according to ASTMD882, and expressed as the average of length and longitudinal direction.

8. Note nature pencil \*\*\*\* or Uni for a \*\*\*\* examination by pencil Mitsubishi was used, and it wrote down by 500g of press, and when a character was able to be written deeply, O and when it was able to write very deeply, O and the case of being thin were made into x.

[0046]

[Effect of the Invention] As the example explained concretely, by using a specific void plasticity polymer, the extremely excellent lightweight nature, an intensity, thermal resistance, concealment nature, note nature, and a productivity are given, and the polyester film offered by this invention exceeds the performance of conventional lightweight-ized polyester greatly in these points.

[Translation done.]